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# A Glimpse of CANADA'S MINERAL INDUSTRY

PREPARED FOR THE
NEW YORK WORLD'S FAIR
1939

MINES AND GEOLOGY BRANCH
DEPARTMENT OF MINES AND RESOURCES
OTTAWA, CANADA

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*A Glimpse*
*of . . . .*

# CANADA'S MINERAL INDUSTRY

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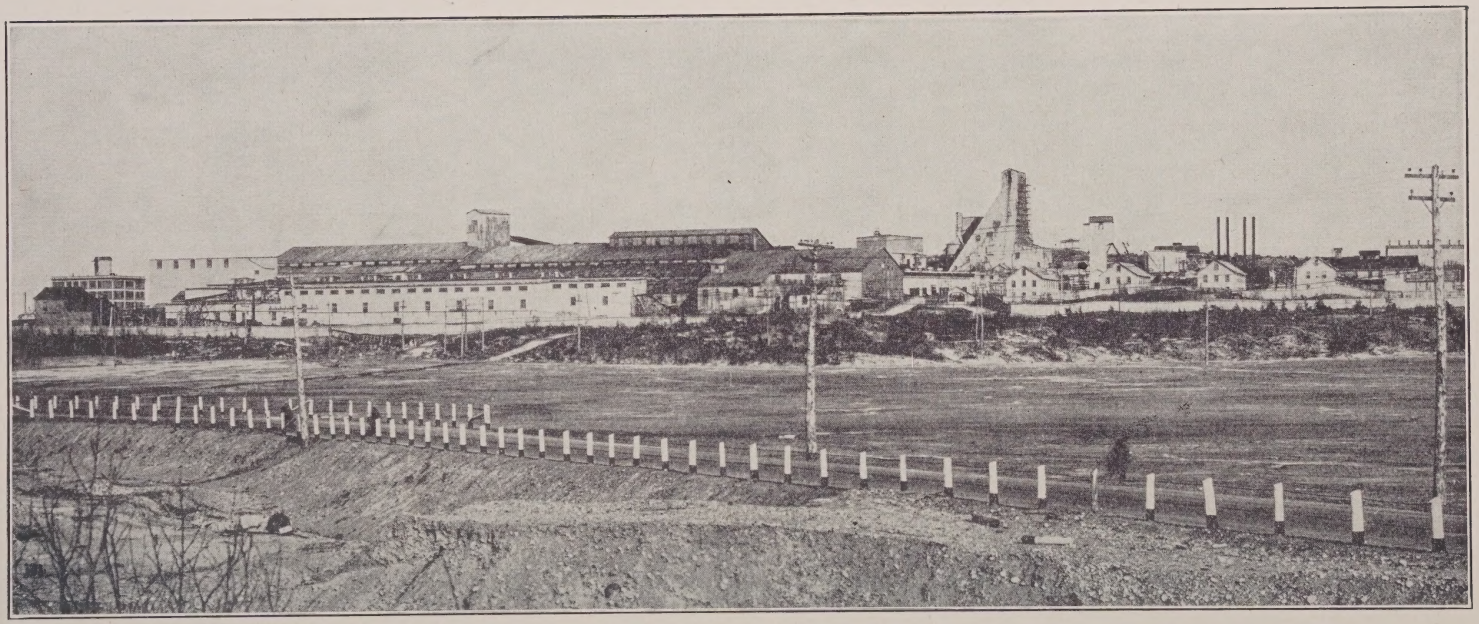
# *FOREWORD*

Mining is now Canada's second most important primary industry, being exceeded only by agriculture in value of annual production. This booklet outlines briefly the more important features of the Dominion's mineral industry, and of its minerals. Information in more detail on any particular phase of the industry may be obtained by writing to the Director, Mines and Geology Branch, Department of Mines and Resources, Ottawa, Canada. The provincial governments also maintain departments from which information on their mineral resources may be obtained. In this connection, the attention of the reader is drawn to the fact that in Canada the actual administration of mineral resources rests with the provinces, who issue prospectors' licences, lease or grant mineral claims, and exercise the usual supervision over mining operations. The Dominion Government, except in the Yukon and Northwest Territories, confines its activities chiefly to the making of geological and topographical surveys for assisting in the discovery of mineral deposits, and of researches designed to assist in the commercial development of mineral deposits, and in the wider use of Canadian minerals. In addition, it assists in the development of export markets, and collects comprehensive and up-to-date material on all matters related to Canadian mining for the information of the miner, the industrialist, and the general public.

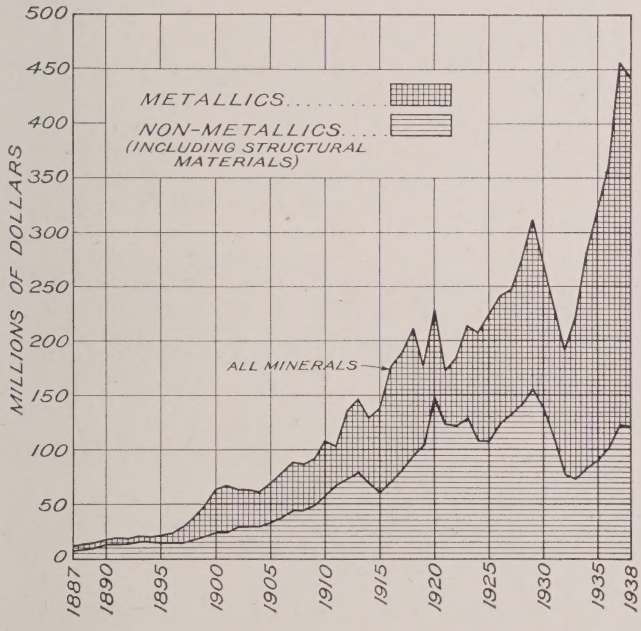
Unless otherwise stated, the Dominion Bureau of Statistics is the source of the statistical information used in this booklet. All tons referred to are short tons of 2,000 pounds.



Hollinger, the pioneer mine of the Porcupine gold camp of Northern Ontario, is one of the world's great gold mines. Discovered in 1909, this gold-quartz property entered commercial production in 1912, and up to the end of 1938 has produced a total of 11,249,308 fine ounces of gold and 2,179,249 fine ounces of silver.

# A GLIMPSE OF CANADA'S MINERAL INDUSTRY

The Canadian mineral industry, which had its beginning over two centuries ago with the opening of a coal pit in Nova Scotia and the mining and smelting of bog iron ore in Quebec, has attained its present growth chiefly within the past forty years. In that period there were few years that did not record substantial increases in annual output values. Moreover, in the past decade when other primary industries were depressed by declining markets and low prices, the Dominion's mining industry has, despite low prices for its products, excepting gold, experienced its largest expansion in aggregate value of production. The following diagram shows not only the rapid growth in annual output values, but the increasing contributions made by metal mining to that growth.




Value of Canada's annual mineral production, 1887 to 1938

Although the value of mineral production in 1938 was lower, about 3 per cent, than in 1937, this was due mainly to reduced prices for copper, lead, and zinc—which together account for almost one-fifth the total value of mineral output—and to the year's reduced market demand for minerals other than metals. Actually, the year recorded new all-time peaks for the quantities of gold, copper, lead, zinc, and the platinum metals produced.

Canada has acquired a leading position among the world's mineral producers, in 1937 ranking first in the production of nickel, asbestos, and platinum; third in gold, silver, and zinc; and fourth in copper and lead. It has also become one of the two principal world sources of radium.

## DISTRIBUTION OF CANADA'S MINERALS

All the provinces and territories, with the exception of Prince Edward Island, contribute to the mineral production. Ontario is, however, the premier mining province, accounting for 49·8 per cent of the 1938 output value, followed by Quebec and British Columbia contributing 15·4 and 14·4 per cent, respectively.

The inset chart on the map of pages 16 and 17 shows the relative contributions made by the several provinces in 1938. In addition, it indicates their relative contributions in 1913, and shows that while all have participated in the mining expansion of the last quarter century, Ontario, Quebec, and British Columbia, the major metal producers, have been the chief contributors to that growth.

## PRE-EMINENCE OF THE METALS IN CANADA'S MINING INDUSTRY

Metals have occupied the most prominent part in the recent expansion of Canadian mining, and now account for about 73 per cent of total value of mineral production. This pre-eminence of metal mining in Canada has been determined by two factors. The first is the world's rising demand for metals, not only for gold, but for the base metals, copper, zinc, lead, and nickel. The second is the large areas in Canada underlain by rock formations favourable to the occurrence of metal ore deposits, which, with the availability of abundant water power resources, can be profitably mined.

The metallurgical plant of Consolidated Mining and Smelting Company at Trail, B.C. The ores treated in this plant yield most of the lead and a very large part of the zinc produced in Canada, also gold, silver, cadmium, sulphur, bismuth, antimony, etc.

Practically all the large metal production from Ontario, Quebec, Manitoba, Saskatchewan, and the Northwest Territories comes from ore-bodies that have been found in the outer fringes of the so-called Canadian Shield, notably the nickel-copper-gold-platinum ores of Sudbury, the copper-gold and copper-zinc ores of the Noranda area, the copper-zinc-gold ores of the Flin Flon area, and the auriferous quartz deposits of Porcupine, Kirkland Lake, and of many other camps distributed from western Quebec to Yellowknife on Great Slave Lake.

The metal production of British Columbia and Yukon comes from deposits that have been found in the Canadian Cordillera, which is the northern continuation of the mountain belt bordering on the Pacific that has been so prolific in metal production in South America, Mexico, and the United States. The Canadian Cordillera has been the scene of two world-famous placer-gold rushes, that of the Cariboo about 1860, and that of the Klondike in 1898. Its lode mining operations for the production of gold, silver, copper, lead, and zinc, although not so spectacular, have been much more important, producing such well known camps as Rossland, Kimberley, Slocan, Boundary, Copper Mountain, Britannia, Bridge River, and, more recently, Zeballos. Its Sullivan mine is one of the greatest lead-zinc deposits of the world.

Much of these two main physiographic regions, the Canadian Shield, comprising some 2,000,000 square miles, and the Cordillera about 500,000 square miles, or together about two-thirds of the area of the whole Dominion, is still to be geologically mapped, and only small portions can be said to have been carefully prospected.

The importance of the export markets in supporting Canada's metal mining industry may be appreciated from the record for 1937 and 1938. Very little of the output of the precious metals, including gold, silver, and the platinum group metals, which together accounted for 38·5 per cent of the Dominion's total mineral output value in the two years, is retained in Canada. Most of the four base metals—copper, lead, nickel, and zinc—which accounted for a further 33·8 per cent of the total mineral output value for the period, was also exported, as indicated by the fact that the excess in value of exports, mostly in refined form and as concentrates, over imports, mostly in manufactured form, amounted to almost 85 per cent of the recorded value of production.

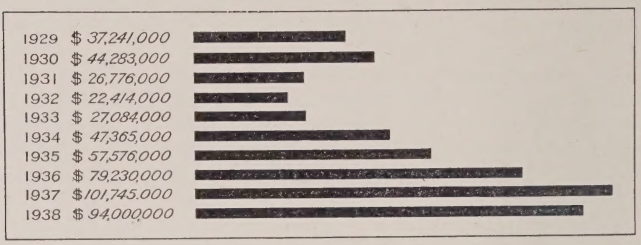
In contrast with the metals, the most profitable outlet for Canada's production of minerals other than metals has, with few exceptions, been the relatively small home markets. The development of the Dominion's widely diversified non-metallic mineral deposits has, therefore, been determined accordingly—the notable exceptions being asbestos and gypsum, which are largely sold abroad. Of the non-metallic products the most important is coal, of which there are abundant reserves in Western Canada and the Maritime Provinces. At the present time petroleum is attracting considerable attention, developments in the Turner Valley field in Alberta since 1936 having already established that province as one of the most important sources of crude petroleum yet found in the British Empire.

## CAPITAL

Although no figures are available on the total capital investment in Canadian mining, the capital employed in mining operations in 1937, including present value of lands and plant but not of ore reserves; cost of materials on hand; and cash, trading and operating accounts and accounts receivable, as reported by the producing mines, totalled $957,345,000, of which 61 per cent was employed in metal-mining and its associated non-ferrous smelters and refineries. Although there is a very substantial investment of United States and British capital in Canadian mining, Canadian capital exceeds that from all other sources by a wide margin.

## METAL MINING DIVIDEND PAYMENTS

The dividend record of the Canadian metal mining industry in recent years has been a particularly impressive one, as illustrated by the following graph:




**Total annual dividends paid by Canadian metal mines 1929 to 1938**

## METAL REFINING IN CANADA

At one time practically all the Canadian metals, other than iron, were shipped abroad for final treatment. With the increasing development of metal mining, large metallurgical and refining plants have been established, notably those at Trail, in British Columbia; Flin Flon, in Manitoba; Montreal, in Quebec; and Copper Cliff, Port Colborne, and Deloro, in Ontario. To-day, Canadian gold, silver, copper, lead, zinc, nickel, as well as other metals are refined in Canada to meet the requirements of the metal markets. This development has been due mainly to abundant sources of cheap hydro-electric power, which has also been a dominant factor in the building up in the province of Quebec of a very substantial production of aluminium from foreign ores.

## THE FUTURE OF CANADIAN MINING

The past record of Canada's mining industry has been one of remarkably sustained growth. The large known mineral reserves, and the very extensive areas in the Dominion known

Mill of Canada's most northerly gold-quartz mine, the Con, at Yellowknife, on Great Slave Lake, N.W.T. This mine, which is about 950 miles north of the Canada-United States boundary, poured its first gold brick in September, 1938.

to contain rock formations favourable to the occurrence of metal ore deposits, but which have as yet not been prospected, give reasonable assurance for future development. The rising world demand in the present metal age for the metals found in these deposits gives reasonable assurance of market outlets, and the abundance of water power resources gives reasonable assurance that the deposits can be worked and the contained metals produced in refined form at costs lower than in many other producing countries, and therefore sold profitably in the world's competitive markets. The Dominion thus rates high in those factors that are essential to the maintenance and growth of mining enterprise.

## CANADA'S MINERALS

The items of Canada's mineral production in 1938 included twenty-one metals, four fuels, twenty-three industrial, or other non-metallic minerals, as well as many clay products, and the structural materials such as cement, lime, stone, sand, and gravel.

The table on page 10, showing the quantities and values of the minerals produced in 1929 and 1938, serves not only to give an appreciation of the diversity of the Dominion's mineral resources, but also of the recent trends in the production of those minerals as determined by the available markets and ability to produce at prevailing prices.

Brief reviews of the more important of these metals and minerals appear below.

## METALS

### Aluminium

Canada, with no known commercial deposits of bauxite, the most important ore of aluminium, is one of the world's large producers of that metal, ranking fourth in 1937. This production comes entirely from two large plants in the province of Quebec, one at Arvida, practically on tide-water on the Saguenay River, and the other at Shawinigan Falls. In 1937 the Canadian production amounted to about 46,000 short tons* of aluminium, or to slightly over 8 per cent of the world output for the year. Most of this production is exported

### Cadmium

Refined cadmium is recovered at Trail, British Columbia, and at Flin Flon, Manitoba, as a by-product from the treatment of zinc ores mined in those areas. In 1938 the output of slightly under 350 tons, 73 per cent from British Columbia, was about 11 per cent less than the peak production of 1936. Most of the Canadian production is marketed in Europe. Canada was the world's second largest producer of the metal in 1938.

### Cobalt

Canada's production of cobalt comes from the silver-cobalt camps at Cobalt, Gowganda, and South Lorrain, in northern

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* According to The Imperial Institute's Statistical Summary of the Mineral Industry of the British Empire and Foreign Countries.

## Items of Canada's Mineral Production, 1929 and 1938

| Mineral Product | 1929 | | 1938 | |
|---|---|---|---|---|
| | Quantity | Value | Quantity | Value |
| | | $000 | | $000 |
| **Metals** | | | | |
| Bismuth lb. | 194,329 | 307 | 9,516 | 10 |
| Cadmium " | 773,976 | 675 | 699,138 | 562 |
| Cobalt " | 929,415 | 1,802 | 459,060 | 789 |
| Copper ton | 124,030 | 43,415 | 293,010 | 58,027 |
| Gold fine oz. | 1,928,308 | 39,862 | 4,715,480 | 165,867 |
| Lead ton | 163,261 | 16,544 | 209,457 | 14,008 |
| Nickel " | 55,138 | 27,115 | 105,337 | 53,949 |
| Palladium, Rhodium, Iridium, etc. fine oz. | 17,318 | 809 | 130,893 | 3,677 |
| Platinum " | 12,519 | 847 | 161,317 | 5,197 |
| Radium and Uranium | 0 | 0 | Figures not published | |
| Selenium lb. | 0 | 0 | 358,929 | 623 |
| Silver fine oz. | 23,143,261 | 12,264 | 22,157,154 | 9,633 |
| Tellurium lb. | 0 | 0 | 48,237 | 83 |
| Zinc ton | 98,634 | 10,627 | 190,753 | 11,724 |
| Other, including molybdenite, antimony, iron ore, mercury, and titanium ore | – | 14 | – | 8 |
| Total Metals | | 154,282 | | 324,157 |
| **Fuels** | | | | |
| Coal 000 tons | 17,497 | 63,065 | 14,248 | 43,912 |
| Natural Gas million cu. ft. | 28,378 | 9,977 | 33,441 | 11,848 |
| Petroleum, crude bbl. | 1,117,368 | 3,732 | 6,956,229 | 11,827 |
| Peat tons | 2,607 | 13 | 500 | 3 |
| Total Fuels | | 76,787 | | 67,590 |
| **Industrial Minerals** | | | | |
| Arsenious oxide ton | 2,615 | 171 | 1,088 | 57 |
| Asbestos " | 305,055 | 13,173 | 289,877 | 12,894 |
| Diatomite " | 429 | 10 | 414 | 14 |
| Feldspar " | 37,527 | 340 | 14,126 | 130 |
| Fluorspar " | 17,870 | 268 | 217 | 4 |
| Graphite " | 1,461 | 103 | – | 42 |
| Grindstones, etc. " | 1,947 | 106 | 194 | 12 |
| Gypsum " | 1,211,689 | 3,346 | 1,019,188 | 1,517 |
| Iron oxide (ochre) " | 6,518 | 116 | 5,322 | 70 |
| Magnesitic dolomite " | 18,809 | 491 | – | 420 |
| Mica " | 4,053 | 119 | 378 | 75 |
| Nepheline syenite | 0 | 0 | – | 143 |
| Salt ton | 330,264 | 1,578 | 468,717 | 1,942 |
| Silica (Quartz) " | 265,949 | 562 | 1,470,991 | 993 |
| Silica brick M | 3,951 | 174 | 1,788 | 100 |
| Sodium sulphate ton | 5,018 | 64 | 62,849 | 551 |
| Sulphur* " | 42,781 | 351 | 112,395 | 1,082 |
| Talc and Soapstone | – | 229 | – | 145 |
| Other† not including structural materials | – | 45 | | 35 |
| Total Industrial Minerals‡ | | 21,246 | | 20,225 |
| **Structural Materials** | | | | |
| Clays and Clay Products | – | 13,905 | – | 4,437 |
| Cement 000 bbl. | 12,284 | 19,337 | 5,519 | 8,241 |
| Lime 000 tons | 674 | 5,909 | 489 | 3,536 |
| Sands and gravel " | 27,847 | 7,318 | 30,557 | 11,114 |
| Stone " | 9,622 | 12,066 | 5,155 | 5,524 |
| Total Structural Materials | | 58,535 | | 32,852 |
| GRAND TOTAL | | 310,850 | | 444,824 |

* Sulphur content of pyrites shipped, and of sulphuric and other products made from smelter gas.

† Actinolite, barytes, beryl, bituminous sand, bog manganese, chromite, lithium minerals, magnesium sulphate, mineral waters, phosphate, sodium carbonate, and volcanic dust.

‡ Excluding structural materials.

Ontario, chiefly as a by-product of silver mining. Recovery in the form of metal, oxides, and salts is made at the smelter and refinery at Deloro, Ontario, although part of the cobalt ore is sold for treatment abroad. Nearly all the cobalt produced, amounting to 229·5 tons in 1938 and to 253·5 tons in 1937, is exported, mostly to the United Kingdom.

### Copper

Canada's production of copper reached an all-time high of 293,010 short tons in 1938, almost three times that of 1928. The Dominion is now one of the world's principal copper-producing countries, ranking fourth in 1937. The production is obtained from the copper-nickel ores of Sudbury in Ontario; the copper-gold ores of Noranda, the copper-zinc ores of Waite-Amulet and Normetal, and the copper-pyrites ores of Aldermac and Eustis, all in Quebec; the copper-zinc ores of Flin Flon and Sherritt-Gordon adjacent to the boundary between northwestern Manitoba and northeastern Saskatchewan; and the copper-zinc-pyrites ores of Britannia and the copper ores of Copper Mountain in British Columbia. Some copper has also been recovered as concentrate from the lead-zinc-copper ore of Stirling mine, Cape Breton, Nova Scotia, but this mine was not producing in 1938. Ontario accounted for 55·4 per cent of the production, Quebec for 19·2 per cent, the Flin Flon and Sherritt-Gordon mines for 14·3 per cent, and British Columbia for 11·1 per cent.

Canada has two copper refineries, one at Copper Cliff, Ontario, with an annual rated capacity of 120,000 tons of refined copper, and the other at Montreal East, Quebec, with an annual rated capacity recently increased to 81,000 tons of refined copper. The former treats the blister copper produced at Sudbury from the local copper-nickel ores, and the latter the anode copper produced from the copper ores of northwestern Quebec at Noranda, also the blister copper produced at Flin Flon.

The Dominion's production in 1938 was valued at $58,026,972. Most of the production is sold for export, the Dominion's net credit on copper trade account, or excess of exports over imports of copper, amounting in 1938 to $52,358,914.

### Gold

From the standpoint of output value, gold is at present Canada's most important metal. The new peak production of 4,715,480 fine ounces in 1938 had a value of $165,867,009, or nearly half of the value of all metals, and 37 per cent of the value of all minerals produced in the Dominion that year. The annual gold production has more than doubled in quantity since 1930, and, due in part to the sharp rise in price in 1934, has almost doubled in value since 1933. The Dominion now ranks third after South Africa and Russia as a world gold producer, its mines yielding about 12 per cent of the total output.

Gold-bearing formations are widely distributed, and all the provinces except New Brunswick and Prince Edward Island contribute to the production. Ontario is, however, the chief gold-producing province, accounting for 61·4 per cent of the 1938 Canadian output. Its quartz-gold mines contributed 59·7 per cent of the Canadian production—two camps, Porcupine and Kirkland Lake, 48·5 per cent. The remaining Ontario production was recovered mostly from the Sudbury nickel-copper-gold ores.

Quebec is Canada's second gold-producing province, accounting for 18·7 per cent of the 1938 output, almost wholly from the northwestern part of the province. The rapidly increasing contributions of the quartz-gold mines there comprise the larger part of the production, although the Noranda copper-gold mine is still the largest single producer.

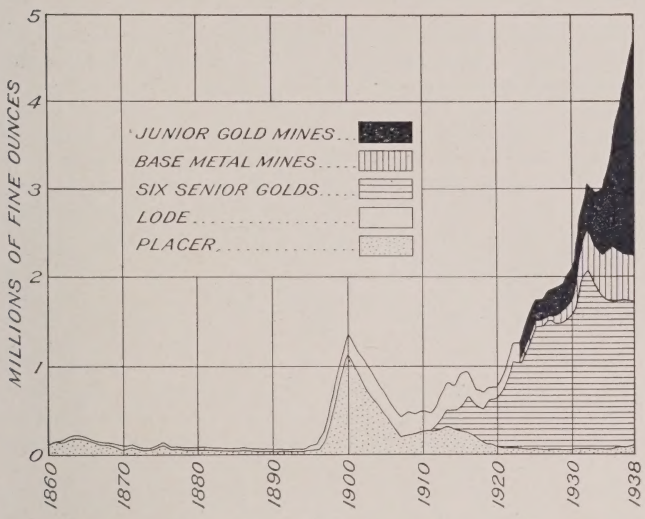
British Columbia is the third most important gold producer, accounting for 12·6 per cent of the 1938 output. Gold quartz mines are the chief sources of the province's gold production, followed by auriferous copper mines. There is also a relatively small production of placer gold, mostly by large-scale hydraulicking operations.

Hydraulicking operations in British Columbia for the production of placer gold. A large stream of water under high head is directed by the monitor against the exposed surfaces of gold-bearing gravels, which are washed into and through the sluice box, where the gold collects. The size of the gulch that is being made indicates the large quantities of material that are thus handled for gold recovery.

The contributions of Manitoba and Saskatchewan, amounting to 5 per cent of the 1938 output, come from gold-quartz mines in Manitoba and from the auriferous copper-zinc ores of the Flin Flon and Sherritt-Gordon properties on and near the boundary between the two provinces.

Yukon Territory, at one time Canada's principal gold producer, contributed 1·5 per cent of the 1938 output, chiefly placer gold. Nova Scotia's small production is from gold-quartz, as is that of the Northwest Territories, commenced at Yellowknife, on Great Slave Lake, only about the middle of the year.

The accompanying chart is of special interest in indicating the changing developments in Canadian gold production since 1860, and particularly the growing importance in recent years of new auriferous quartz mines.




CANADA'S ANNUAL GOLD PRODUCTION, 1860 TO 1938

The production of lode gold, which includes all gold other than placer gold is separated according to origin as follows:—

*Six Senior Golds*—Commencing in 1912, and including the lode gold produced by the six large gold-quartz mines of the Porcupine and Kirkland Lake gold camps of northern Ontario that came into production in the period from 1912 to 1921. These mines, commonly known as "the six senior golds," include Hollinger, Lake Shore, McIntyre-Porcupine, Dome, Teck-Hughes and Wright-Hargreaves.

*Junior Gold Mines*—Commencing in 1923, and including the lode gold produced by all the other gold-quartz mines in Canada.

*Base Metal Mines*—Commencing in 1923, and including the lode gold produced as a by-product of the mining of the base metals, viz., copper, nickel, lead, and zinc.

*Lode*—Includes all lode gold produced prior to 1923 that is not otherwise allocated.

## Iron Ore

Deposits of iron ore, including hematite, siderite, and magnetic iron ore, occur in Canada, and some of these have been worked at various times. Because of the availability of higher grade ores in the Minnesota iron ranges and in Newfoundland at relatively low cost, the blast furnaces of Ontario and Nova Scotia have used no Canadian iron ore since 1923. Preparations are now being made for resuming production of iron ore in the Michipicoten area north of Lake Superior in the near future; and further explorations are in progress on a large deposit of hematite ore recently discovered at Steeprock Lake, west of Port Arthur.

## Lead

Canada is one of the world's leading sources of lead, ranking fourth among the producing countries in 1938 with its production of slightly over 11 per cent of the total reported production.

The Canadian output of 209,457 tons in 1938 was the highest on record, exceeding that of the preceding year by 1·7 per cent. By reason of the lower prices, the value of the peak production of 1938 amounted to only about two-thirds of that of the year before, or to $14,008,459.

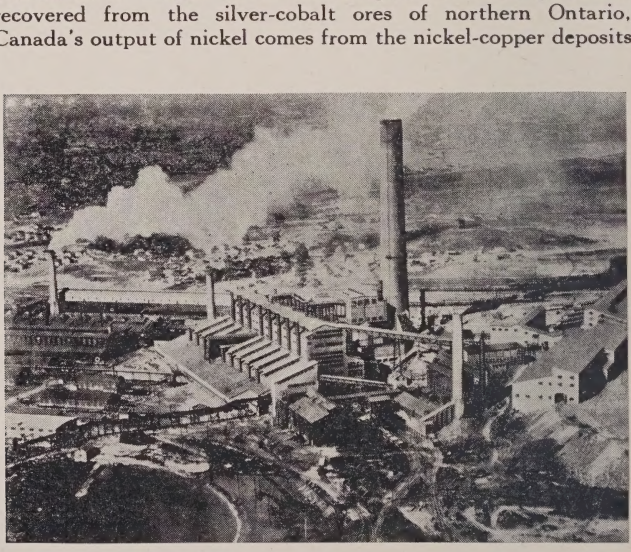
British Columbia is the chief lead-producing province, contributing almost 99 per cent of the 1938 output, mostly from the Sullivan silver-lead-zinc mine at Kimberley. Other important sources in the province have been the Monarch silver-lead-zinc mine near Field, and several silver-lead and silver-lead-zinc mines in the Kootenay and other districts. The remainder of the 1938 output came principally from high-grade silver-lead deposits in the Mayo area of Yukon Territory. There was also a small recovery of by-product lead from the treatment of silver ores from northern Ontario at the Deloro refinery. No production was reported for the year from a lead-zinc mine in Portneuf County, Quebec, or from a lead-zinc-copper property at Stirling on Cape Breton Island.

Canada has one lead smelter and electrolytic refinery, with a rated yearly capacity of 205,000 tons of refined lead, located at Trail, British Columbia.

Normally consuming from 30,000 to 35,000 tons of lead annually, the Dominion produces mainly for export, the 1938 shipments abroad including 154,932 tons of pig lead, 3,581 tons contained in ore, and 35 tons of white lead. The United Kingdom absorbed 75 per cent of the total volume of lead exports for the year.

### Nickel

Canada furnishes about 90 per cent of the world's annual production of nickel. With the exception of small quantities recovered from the silver-cobalt ores of northern Ontario, Canada's output of nickel comes from the nickel-copper deposits



The International Nickel Company's smelter at Copper Cliff, Ontario, converts nickel-copper ore concentrate into nickel-copper matte, and is therefore an important link in the metallurgical chain producing refined nickel, copper, gold, selenium, tellurium, and the several platinum metals from the ores raised in the company's mines in the Sudbury area.

of the Sudbury area, also of northern Ontario. Other deposits of nickel-bearing ores have been found in northern and northwestern Ontario, New Brunswick, Manitoba, British Columbia, and in the Northwest Territories on the west coast of Hudson Bay. Development work has been carried on in recent years on a British Columbia deposit, and experimental shipments of concentrate were made in 1937. The operations of the Sudbury area are divided between two corporations, much the larger of which is the International Nickel Company, working several mines, treating its ores in its own smelter in the area, and producing refined nickel in its own refinery at Port Colborne, Ontario. The other, Falconbridge Nickel Mines, Limited, produces nickel-copper matte from its own mine and smelter near Sudbury, but exports the matte to Norway for refining.

Production in 1938 amounted to 105,337 tons, or 6·3 per cent below the all-time peak of 1937. The latter was, however, more than double the pre-depression peak of 1929, indicating the rapidly increasing use of the metal in recent years, largely for the production of nickel steels, nickel cast-iron, and nickel-copper and nickel-silver alloys.

About 98 per cent of the Canadian production over the past fifteen years has been sold for export, although several hundreds of tons are returned annually in the form of manufactured products. In 1938, the Dominion's credit balance in foreign trade on nickel account amounted to $51,095,079, as compared with the all-time high of $57,440,497 in 1937.

### Platinum Group Metals

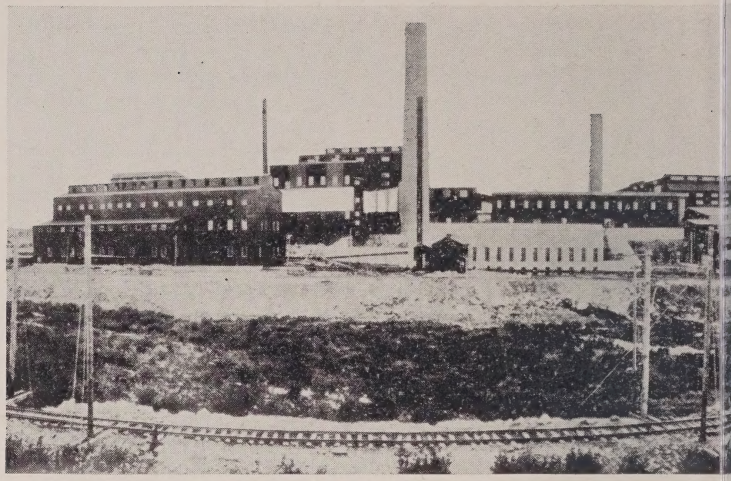
(Including Platinum, Palladium, Iridium, Rhodium, Ruthenium and Osmium).

Canada became the world's leading producer of the platinum group metals in 1934. With the exception of a few ounces of placer platinum recovered in the Tulameen area of British Columbia, and a very small recovery from the refining of gold at Trail in the same province, the Canadian production comes from the nickel-copper ores of the Sudbury area of Ontario. The small quantities that are contained in these ores collect in the sludge remaining from the electrolytic refining of the nickel. The sludge from the International Nickel Company's refinery at Port Colborne, Ontario, is treated for the recovery and separation of the several metals of the group at Acton, England; and the Falconbridge Nickel Mines, Limited, added a unit for the recovery of the platinum metals to its refinery in Norway in 1935.

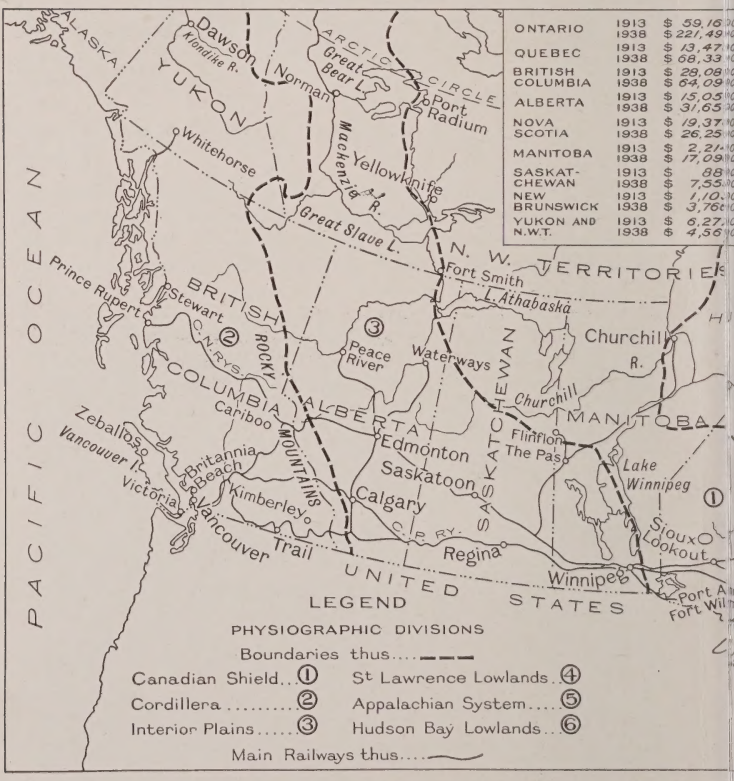
The 1938 production of 292,210 fine ounces—of which 55 per cent was platinum—was the highest on record, representing an increase of almost 13 per cent over the preceding year. Owing to declining prices of platinum, the value of this increased output, amounting to $8,873,896, was $1,058,702 less than in 1937. As practically the whole of the production is recovered in refineries outside of Canada, it is sold abroad.

### Radium and Uranium

Very important deposits of rich silver-bearing pitchblende were discovered in 1930 at Echo Bay on the eastern shores of Great Bear Lake in the Northwest Territories. Despite the severe transportation handicaps in the commercial development of ore deposits in such remote areas, mining operations have been

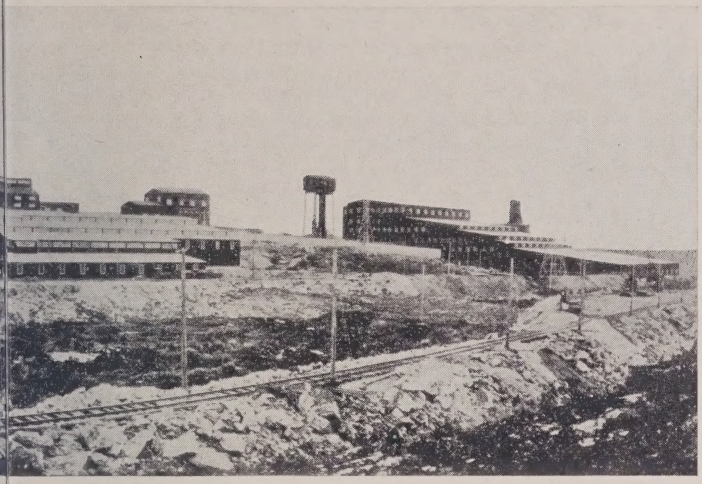


Metallurgical plant of the Hudson Bay Mining and Smelting Company, Flin Fl
This plant produces mainly bliste

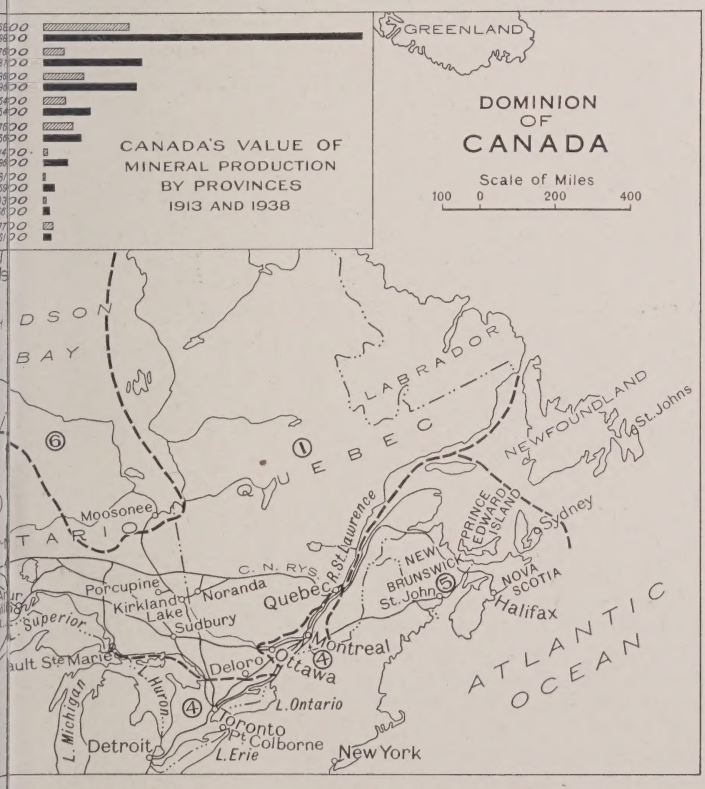



Sketch map of Canada outlining the main geological divisions. All but a small
been found in two of these divisions, viz., the Canadian Shield (1) and the Cordill
the area of Canada, has still to be geologically mapped, and only relatively small po

The chart shows the comparative growth in mineral production made by the sev



mine, Man., about 400 miles north of the Canada-United States boundary.
pper, zinc, gold and cadmium.




rtion of the Dominion's large metal production comes from ore bodies that have
(2). Much of these two divisions, which together comprise about two-thirds of
ns have as yet been carefully prospected.
l provinces in the last quarter century.

increasingly expanded for the production of pitchblende concentrate that are shipped to a refinery at Port Hope, Ontario. Products include radium bromide, yellow and orange sodium uranate, black uranium oxide, and other uranium salts. Although production figures are not yet available for 1938, the total recovery up to the end of 1937 was reported at 54 grammes of radium, and 255 tons of uranium salts. The refinery has recently been enlarged, now having a yearly capacity of some 900 tons of pitchblende concentrate, equivalent to about 96 grammes of radium.

Canada's radium production comes from the pitchblende-silver ores of the Eldorado mine at Port Radium, on the east shore of Great Bear Lake, N.W.T.—only a few miles south of the Arctic Circle.

### Selenium and Tellurium

Canada shares with the United States in the production of most of the world's output of selenium and tellurium. Both metals occur in small quantities in the copper ores of Ontario, Quebec, and Manitoba, and are recovered at Copper Cliff, Ontario, and Montreal, Quebec from the slimes formed in the electrolytic refining of the blister copper produced from these ores. Production of selenium commenced in 1931, and of tellurium in 1934. The output of 179·5 tons of selenium in 1938 was about 10 per cent lower than the peak production of 1937, while the 1938 production of 24·1 tons of tellurium was the highest so far recorded. Most of the production is exported, chiefly to Great Britain.

### Silver

Canada is the world's third largest producer of silver, its output in 1937 being exceeded only by Mexico and the United States. The production in 1938, amounting to 22,157,154 fine ounces, was, however, little more than two-thirds of the all-time peak of 1910, when the Cobalt camp of northern Ontario was at its maximum production.

Most of the present production is recovered as a by-product of the treatment of ores mined primarily for the production of lead, nickel, copper, zinc, gold, and radium. British Columbia is the leading silver producing province, a large part of its contribution of 50·3 per cent of the 1938 production, coming from the Sullivan silver-lead-zinc mine at Kimberley. Ontario ranks second, its contribution of 19·5 per cent, coming chiefly from the silver mines of Cobalt and adjoining areas, and from the nickel-copper ores of Sudbury and the gold-quartz ores of northern

Ontario. Yukon Territory is third, contributing 12·8 per cent. mostly from the silver-lead mines of the Mayo area. Manitoba and Saskatchewan's joint contribution of 9·5 per cent originates in the copper-zinc operations of the Flin Flon area; Quebec's of 5·4 per cent, mostly from the base metal and gold-quartz ores of the northwestern part of the province; and the 2·5 per cent from the Northwest Territories almost wholly from the pitch-blende-silver ores mined on Great Bear Lake. There is also a small production in Nova Scotia and Alberta.

A large part of the production is refined in Canada, the export figures for 1938 indicating that about 80 per cent was in the form of bullion and the rest in ore and concentrate. Practically the whole of the output is sold abroad, the United States being the chief purchaser.

### Zinc

Canada is one of the world's chief zinc producers—ranking third after the United States and Australia, with Germany a close fourth in 1937. Its production of the metal has practically doubled in the last decade, the 190,753 tons recorded in 1938 being an all-time high. The production in the Dominion is very largely for export purposes, Great Britain being the largest buyer.

British Columbia leads the provinces in zinc production, accounting for 78·5 per cent of the total output in 1938. One mine alone, the Sullivan, at Kimberley, furnished almost three-quarters of the entire Canadian production. The rest of the province's contribution came from several lead-zinc properties in the West Kootenay district. About 20 per cent of the Dominion's production in 1938 came from the Flin Flon copper-zinc operations on the Saskatchewan-Manitoba boundary and from the neighbouring Sherritt-Gordon copper-zinc mine in northwestern Manitoba; and the remaining 1·5 per cent from the Normetal and Waite-Amulet copper-zinc mines in northwestern Quebec. Other zinc properties in Quebec, Cape Breton Island, Nova Scotia, and near Sudbury, Ontario, were idle during the year.

Canada has two zinc refineries, one at Trail, British Columbia, and the other at Flin Flon, Manitoba, with rated annual capacities of 145,000 and 30,000 short tons, respectively, of slab zinc. Substantial tonnages of zinc in the form of concentrate are, however, exported each year, the zinc content of such concentrate exported in 1938 amounting to about 12 per cent of the entire zinc production recorded for the year.

## FUELS

### Coal

The Dominion possesses large coal reserves, but distributed only in the Maritime Provinces and Western Canada. Ontario and Quebec, with over 60 per cent of the total population and the larger part of its manufacturing industry—and therefore major coal consuming provinces—have no coal deposits, except undeveloped beds of low-grade lignite southwest of James Bay. Being more conveniently situated to the coalfields of Pennsylvania and neighbouring states than to the Canadian fields, these two provinces have drawn upon these foreign sources for a very large part of their coal supply. Canada's coal position is thus one of a country with abundant coal resources importing roughly half its annual supply.

Alberta is the Dominion's richest coal province, its reserves including coals of all classes, although very little anthracite is produced. British Columbia's reserves are mainly of bituminous coal, Saskatchewan's are entirely of lignite, and those of Nova Scotia and New Brunswick are practically all of bituminous coal.

Total production in 1938 aggregated 14,247,783 tons, about 10 per cent less than in 1937, and about 19 per cent less than the all-time peak production of 17,564,293 tons in 1929. Nova Scotia contributed about 44 per cent, Alberta 37 per cent, British Columbia 10 per cent, Saskatchewan 7 per cent, and New Brunswick 2 per cent.

Exports for the year amounted to 353,181 tons, while imports totalled 13,464,060 tons, about 86 per cent from the United States, and the rest, mostly anthracite, mainly from Great Britain. In addition, substantial tonnages of coke are imported, the excess of imports over exports being 384,178 tons in 1938.

### Natural Gas

Although natural gas has been found in nearly all the provinces, 98 per cent of Canada's recorded production of 33,441,139 M cubic feet for economic use in 1938 came from Alberta and Ontario. The production in New Brunswick from a field near Moncton is relatively small, amounting to 577,492 M cubic feet in 1938, as was the 87,422 M cubic feet from the newly discovered Lloydminster field in Saskatchewan. There is also a small production from Manitoba.

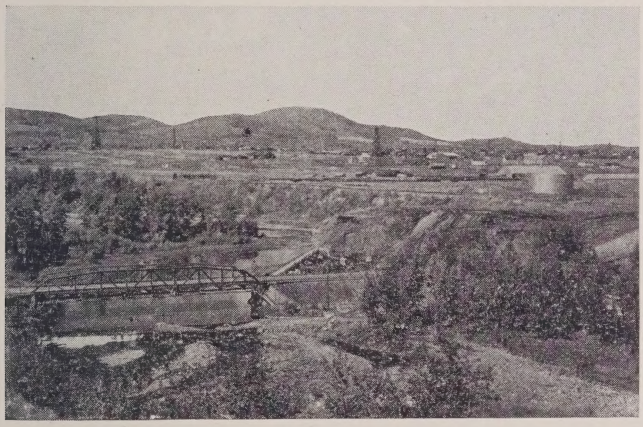
Ontario's production comes almost entirely from the Welland-Lake St. Clair area of the southwestern peninsula. Commencing in 1889, annual production reached its maximum of 19,868,035 M cubic feet in 1917, then declined to a low of 7,143,962 M cubic feet in 1925; but with renewed exploration and drilling has again risen to 10,973,125 M cubic feet in 1938, used wholly in the province.

Alberta is Canada's chief natural gas producing province, with a wide distribution of known reserves. Practically all the larger urban centres in the province are now served from developed fields. The principal producer is the Turner Valley field, southwest of Calgary. Production for distribution in the province was reported at 21,800,000 M cubic feet in 1938, and was limited by the available markets, as large quantities produced incidental to petroleum production in the Turner Valley field have been wasted for lack of markets. This wastage has already been sharply reduced by the recently created provincial Petroleum and Natural Gas Conservation Board.

### Petroleum

Canada's annual production of petroleum recorded an all-time high of 6,956,229 barrels in 1938—more than two and a third times that of 1937. This production comes from Alberta, Ontario, New Brunswick, and from two wells, yielding 22,854 barrels in 1938, near Norman in the Northwest Territories. The New Brunswick production from the Stony Creek field south of Moncton is also small. The Ontario production comes from the southwestern part of the province, the discovery of the Oil Springs-Petrolia field approximating the bringing in of the Drake well in Pennsylvania. The output of 172,059 barrels in 1938 was about one-fifth of the province's all-time peak annual output of 1894.

Alberta is, however, Canada's chief petroleum producing province, the Turner Valley field, southwest of Calgary, accounting for over 99 per cent of the province's production of 6,742,039 barrels in 1938. Until 1936 the wells drilled in this field produced mainly wet gas from which crude naphtha was recovered. That year, a well drilled on the west flank of the field was brought in as a producer of high gravity crude petroleum, and drilling operations since have established Turner Valley as a major field. Despite proration in this field made necessary by the limited available markets, the 1938 output was almost two and a half times that of 1937. Other small producing fields include the Red Coulee and Taber fields in the southern section and the Wainwright field in the central eastern section; and the province contains large areas with formations considered as favourable to the finding of oil pools.



A portion of the Turner Valley oil field in Alberta, southwest of Calgary, which has, since 1936, become one of the most important producers of crude petroleum in the British Empire.

Canada has been largely dependent upon foreign sources, mostly the United States and South America, for her large petroleum requirements, such dependence averaging about 97 per cent over the quarter century ending in 1936. The recent increased production from the Turner Valley field reduced this dependence to about 93 per cent in 1937, and to about 86 per cent in 1938.

## INDUSTRIAL MINERALS

### Arsenious Oxide

Although arsenic is a metal, Canada's production of arsenic is not produced in metallic form but mainly as white arsenic, or arsenious oxide, derived as a by-product of the final treatment at the Deloro refinery of Ontario silver-cobalt-arsenic ores, chiefly from Cobalt. The refinery also manufactures such arsenic insecticides as Paris green, lead arsenate, and arsenate of lime. Production is determined by the market demand. Other arsenic-bearing mineral deposits occur, chiefly in Nova Scotia, Ontario, and British Columbia.

The production of all arsenic compounds aggregated 1,083 tons in 1938. Exports were reported at 689 tons, and imports at 377 tons.

## Asbestos

Canada is the world's leading producer of asbestos, from large deposits of chrysotile in the Eastern Townships of Quebec. Chrysotile is the chief spinning fibre variety of asbestos, and the Canadian product, because of its superior qualities, including softness, silkiness, and textile strength, is in active demand on the world's markets for all kinds of asbestos products, but especially for textiles. Deposits of fibrous material similar in structure but lacking the fineness and elasticity of chrysotile fibre, though suitable for making mineral fillers, have been reported in other parts of Canada. Development of a chrysotile deposit in Ontario is in progress, but no commerical production has yet been reported.

Asbestos veins in rock face of an asbestos mine in the Eastern Townships of Quebec

About 1 per cent of the production in 1938 was of the highest grade hand-cobbed long fibre crude, valued at an average of $328.32 per ton; 56 per cent was of the mill fibre grade, averaging in value $59.53 per ton; and the rest was graded as shorts with an average value of $17.97 per ton. The production of 289,877 tons in 1938 represented a sharp drop from the all-time peak of 410,026 tons in 1937. Most of the output is exported, the United Sta tes being the largest buyer.

### Feldspar

Pegmatite dykes, the main source of commercial feldspar, are widely distributed throughout the Precambrian areas of eastern and northern Canada, and the potential reserves of feldspar are large. Production began nearly 50 years ago, and has aggregated over three-quarters of a million tons, all of which, except a few thousand tons mined in the Pointe du Bois district of Manitoba since 1933, has come from Quebec and Ontario. Most of the current production—14,128 tons in 1938, or about two-thirds that of 1937—comes from Papineau County, Quebec, and Lanark County, Ontario, and is largely exported as unground crude to the United States. Feldspar is now meeting increasing competition from nepheline syenite in glass-making, and from other materials for ceramic purposes.

### Graphite

The entire Canadian production of graphite in recent years has come from a single deposit in Renfrew County, Ontario. This deposit is of exceptional size and richness, and, although the flakes are too small to be suitable for crucible making, the graphite produced is well adapted for lubricants and foundry facings. Latterly, the highest grade has been exported to the United States for pencil making. The output value of $41,590 in 1938 was slightly less than a third that of 1937, due to reduced demand in the export markets that absorb practically the whole of the Canadian production.

### Gypsum

Canada ranks fifth among the world's gypsum producers. It is also a leading exporter, about 80 per cent of its production being sold abroad, mostly to the United States and Great Britain. Nova Scotia is the chief gypsum producing province, accounting for 86 per cent of the Dominion's production of 1,109,188 tons in 1938, followed by Ontario, New Brunswick, British Columbia, and Manitoba. There are extensive deposits in all of these provinces as well as in northern Alberta. The deposits in the Maritime Provinces are conveniently situated near tidewater, and thus enjoy exceptional advantages with respect to exploitation for the export markets, which absorb almost entirely gypsum in the crude lump form, whereas disposal in the home markets is almost wholly as manufactured products.

### Magnesite

No magnesite, within the strict meaning of the term, is produced in Canada, but deposits of magnesitic dolomite in Argenteuil County, Quebec, have been worked since 1907, and the output processed for use as refractory materials. Large deposits of magnesite, containing silica and alumina, in southern British Columbia have received some attention, but no commercial production has yet been reported. Other magnesitic deposits in Quebec, Ontario, and British Columbia are under investigation.

The annual output value reached an all-time high of $768,742 in 1936, this value including the value added to the calcined material on further manufacture into bricks, shapes, cement, etc. The output value of $420,261 reported in 1938 includes only the value of the calcined material.

### Mica

Although mica deposits are widely distributed throughout the Dominion, production, virtually all of phlogopite or amber mica, comes almost entirely from deposits in the neighbourhood of Ottawa, including the Lièvre and Gatineau River areas of Quebec and the Perth-Kingston section of eastern Ontario. There is also a small production of fine flake muscovite from a deposit near Prince Rupert, British Columbia.

Production in 1938 aggregated 377 tons, very substantially less than the 945 tons produced in 1937, and a sharp drop from the peak production of 4,091 tons in 1925, owing in large part to the difficulty of competing in the world's markets with amber mica produced at lower cost in Madagascar. Quebec accounted for 57 per cent of the quantity produced in 1938, and, due to its production of the higher priced grades used chiefly in the manufacture of electrical equipment, for nearly 96 per cent of the value. Most of the production is exported.

### Salt

Salt is one of Canada's most important non-metallic minerals. It occurs, either in natural brines, pumped from wells, or in beds as rock salt. The present production comes from brine wells in southwestern Ontario, at Neepawa, Manitoba, and, commencing in 1938, at McMurray in northern Alberta; and from rock-salt mining operations at Malagash, Nova Scotia.

Canada's salt production recorded a new all-time high of 468,717 tons in 1938, about 2 per cent higher than in 1937. Large quantities are used in chemical industries for the manufacture of such products as caustic soda, chlorine, calcium chloride, soda ash, and hydrochloric acid, about 43 per cent of the 1938 production being reported as so used. The apparent consumption in the Dominion has averaged about 565,000 tons annually for the past two years. Imports in 1938 exceeded exports by 96,289 tons.

### Silica (Quartz)

Silica in the form of sand, sandstone, quartz, and quartzite is widely distributed in the Dominion. Production is mainly in Ontario and Quebec, as the industries there are the principal domestic markets for this relatively low-priced mineral. A substantial tonnage of low-grade silica sand is produced in Saskatchewan for fluxing use at the Flin Flon copper-zinc smelter. Ontario accounted for almost seven-eighths of the total tonnage produced in 1938, mostly, however, of the low-grade sands for smelter flux. Quebec's production, though relatively small in volume, is mainly of the higher grades used for glass-making, in foundries, for sand-blasting, and in the making of ferrosilicon, metallic silicon, and abrasives.

Production aggregated 1,470,991 tons in 1938, much the largest item being low-grade fluxing sands. There is still a large annual importation of silica, mostly of the high-grade sand used for glass-making, filtration, sand-blasting, and carborundum-making.

The steel plants at Sault Ste. Marie, Ontario, and Sydney, Nova Scotia, manufacture their own requirements of silica brick for furnace construction and repairs from Canadian silica, such production having a reported value of $100,403 in 1938. The rest of Canada's needs of silica bricks and shapes for blast-furnace lining, coke ovens, etc., is imported, such imports in 1938 being valued at $240,184.

### Sodium Sulphate (Natural), or Salt Cake

Natural sodium sulphate, or Glauber's salt and salt cake, is found in crystal form or as brine in numerous lakes and sloughs in the Prairie Provinces and British Columbia. A bed of glauberite ($Na_2SO_4$, $CaSO_4$) from 60 to 100 feet thick, overlying large beds of rock salt, was discovered at Weldon, New Brunswick, in drilling for natural gas in 1937. This deposit, which contains from 25 to 30 per cent of sodium sulphate, is still under exploration.

With the exception of a small tonnage of crude salts produced in Alberta for local use, the Canadian production comes from Saskatchewan, where refining and drying plants are in operation at a number of deposits for turning out a high-grade product, the principal markets being the pulp and paper, and copper-nickel refining industries. Most of the Canadian requirements are supplied from Canadian sources, the output in 1938 being 62,849 tons as compared with imports of 5,786 tons of salt cake and 2,266 tons of Glauber's salt.

### Sulphur

No workable deposits of native or elemental sulphur have been found in Canada. Two plants, one at Trail, British Columbia, and the other at Copper Cliff, Ontario, are, however, producing sulphur in the form of sulphuric acid, and as elemental sulphur from the smelter gas resulting from the treatment of sulphide ores mined primarily for the production of nickel, copper, lead, and zinc.

Sulphur is also recovered in the form of pyrites concentrate from the treatment of the copper-pyrites ores of the Eustis and Aldermac mines in Quebec, and of the Britannia mine in British Columbia. A plant is under construction at the Aldermac mine for the recovery of elemental sulphur from such concentrate.

The production of 130,913 tons of sulphur content of these products in 1937 was the highest recorded in Canada, being almost double that of 1935, and about a sixth higher than in 1938.

### Talc and Soapstone

Both talc in its purer forms, and talcose rocks, the latter known as soapstone, occur in extensive deposits at numerous places in Ontario, Quebec, and British Columbia.

Deposits near Madoc, in eastern Ontario, yielding a superior white foliated talc, are among the most important deposits of high-grade talc on the continent, and are the chief sources of Canada's production. There is also a small talc production in the Eastern Townships of Quebec, and, intermittently, in British Columbia from deposits in the central part of the province and on Vancouver Island. The production of soapstone blocks comes from the Eastern Townships in Quebec, and is sold for Canadian use, whereas a large portion of the talc output is exported, mainly to the United States.

The 1938 production of 10,853 tons of talc, valued at $109,810, was the lowest of any year since 1923—the annual output having reached a peak of 15,509 tons in 1929. The production of soapstone is relatively smaller, its value in 1938 amounting to $35,038.

## STRUCTURAL MATERIALS

Structural materials, including clay and clay products, cement, lime, stone, sands, and gravel, are produced as required across the Dominion for the domestic markets, exports being relatively unimportant. Annual production varies with construction activities, the output values recording an all-time high of $58,534,834 in 1929, falling to $16,696,687 in 1933, the bottom year of the depression, recovering to $34,869,699 in 1937, and declining to $32,852,496 in 1938. Ontario and Quebec together account for about 70 per cent of the present value of production.

### Clays and Clay Products

Beds of clays and shales suitable for brick-making are widely distributed, and fireclay deposits are worked in southwestern British Columbia, southern Saskatchewan, and Nova Scotia. Although china clay has been produced commercially in Quebec, there is no production at present, Canadian requirements being imported almost wholly from England. Other important deposits have been found in northern Ontario and central British Columbia. There is a small production of ball clays in southern Saskatchewan, and of bentonitic clays in British Columbia and Alberta; with other deposits of the latter in Manitoba under exploration. Clays and clay products were produced in 1938 to the value of $4,437,086, slightly less than a third of the 1929 peak, and much less than the imports, which amounted to $6,757,543 in 1938.

### Cement and Lime

Canada is self-sufficient in materials for the manufacture of Portland cement, which is produced as required by plants in Quebec, Ontario, Manitoba, Alberta, and British Columbia. Quicklime and hydrated lime are produced in all the provinces except Prince Edward Island.

### Stone

Canada possesses, widely distributed and in great abundance, nearly every kind of stone that is used for structural, monumental, and industrial purposes. Production is determined by the domestic requirements, for road construction, railway ballast, etc. Limestone accounted for about seven-eighths of the total of 5,154,858 tons produced in 1938, and is used also largely for fluxing purposes, less than one per cent being used in block form for building stone, including the mottled Tyndall limestone of Manitoba, the Queenston limestone of Ontario, and the Deschambault limestone of Quebec. Large additional quantities are quarried for lime and cement-making. Granite, accounting for 9·5 per cent of the 1938 output, is produced mainly in Ontario, Quebec, and British Columbia, Quebec being the principal source of blocks. Sandstone comprised only 2·1 per cent of the production, while the small production of marble of varying tints and colours came almost wholly from Ontario and Quebec.

### Sand and Gravel

Deposits are numerous and widely distributed, and the 1938 production was the highest on record.

## MINERALS OF LESSER IMPORTANCE

### Antimony

Small deposits of antimony ore are known in several parts of Canada, and there was a small intermittent production of ore and refined metal in the Maritime Provinces prior to 1917. The only production in recent years has been of small quantities of concentrate in Nova Scotia for experimental shipment.

A plant was recently placed in operation at Trail, British Columbia, for the production of high-grade electrolytic antimony from flue dust produced in the treatment of certain silver-antimony ores mined in the province.

### Barite

Deposits have been found in Nova Scotia, New Brunswick, Quebec, northern Ontario, and British Columbia. The very small intermittent production has come from Nova Scotia chiefly, and from Ontario.

### Beryl

There are deposits of possible commercial importance in Renfrew County, Ontario, and in southeastern Manitoba. Development work is in progress on the former, some 50 tons of hand-cobbed crystals being stock-piled in 1938.

### Bismuth

Refined metal has been produced since 1929 at Trail, British Columbia, as a by-product of the treatment of lead-zinc ores, production depending upon the foreign market demand. There is also a small recovery in Ontario from silver ores mined in the northern part of the province. The peak annual output of 1936 amounted to 182·1 tons.

### Bituminous Sands

There are very extensive deposits in the lower Athabaska River area of northern Alberta, estimated to contain 500,000,000,000 cubic yards with a bitumen content varying as high as 20 per cent. The commercial exploitation of these deposits is just commencing, the year 1938 recording an output of 300 tons of asphalt and nearly 1,300 barrels of fuel oil from one new plant; and another plant under construction.

### Chromite

While no production was reported in 1938, there has been a small production aggregating about 1,500 tons in the past decade, mostly from the Eastern Townships of Quebec. Deposits in British Columbia and at Obonga Lake in northern Ontario have been under exploration.

### Diatomite

There is a small production in Nova Scotia; and deposits in the Georgian Bay area of Ontario, and in central British Columbia are under development.

### Fluorspar

There are few important occurrences in Canada, the most important—in British Columbia—being mined only intermittently. The small output of 217 tons in 1938 came from deposits near Madoc in eastern Ontario.

### Garnet

A small production was reported from deposits near Bancroft in eastern Ontario in 1923 and 1924. Development work was in progress in 1938 on the Bancroft deposits, also on deposits near Labelle, Quebec.

### Grindstones, Pulpstones, etc.

There is a small decreasing annual production of grindstones and scythestones from materials quarried in Nova Scotia and New Brunswick. The year 1938 was the first year since 1916 in which pulpstones have not been produced in the Dominion, the output in recent years coming from sandstone beds on Gabriola Island, near Nanaimo, Vancouver Island.

### Iron Oxides (ochres)

An annual production averaging about 5,600 tons has been reported over the past ten years from deposits in Quebec and British Columbia, chiefly the former; and there are many undeveloped deposits in those provinces as well as in Nova Scotia, Ontario, and the Prairie Provinces.

### Lithium Minerals

Deposits of amblygonite, spodumene, and lepidolite have been found in eastern Manitoba. While these are under exploration and development, no commercial production has as yet been reported.

### Magnesium Sulphate

Natural Epsom Salts are found in brine lakes and lake bottom deposits in British Columbia, also associated with sodium sulphate in similar types of deposits in Alberta and Saskatchewan. The present production, amounting to 470 tons of refined product in 1938, comes from a deposit near Ashcroft, in central British Columbia.

### Manganese Ore

No large deposits of manganese ore of commercial grade have been found in Canada. There has, however, been a small intermittent production of ores, including pyrolusite, manganite, psilomelane, and bog manganese, from Nova Scotia and New Brunswick, with occasional shipments from British Columbia. With the exception of the bog manganese, these ores have been high in manganese content and fairly free from injurious impurities. No production was reported in 1938, and only 85 tons, from New Brunswick, in 1937.

### Mercury

Cinnabar occurrences have been reported in several localities in British Columbia, and one in Ontario. Development work is being done on two of the British Columbia deposits, from one of which—in the Bridge River area—there was a production of 760 pounds of metallic mercury in 1938.

### Molybdenite

There was a substantial production of molybdenite in Quebec during the Great War, principally from a deposit at Quyon, west of Ottawa. At that time this mine was the world's leading molybdenite producer. Production ceased entirely in 1929 after a period of small and irregular operation. Deposits have been discovered in Nova Scotia, Quebec, Ontario, Manitoba, and British Columbia, and several of these were being actively explored in 1938.

### Moulding Sands

Natural bonded moulding sand has been produced at some time in all the provinces, the chief source of production, amounting to 16,000 tons in 1938, however, being the Niagara-Hamilton area of Ontario. From 50 to 60 per cent of the Canadian requirements are imported, mostly from the United States.

### Oil Shales

Extensive deposits of oil shales in Nova Scotia and New Brunswick have been the subject of considerable exploration and experimental work, but are not as yet under development.

### Peat

Deposits are of widespread occurrence, and there are large reserves of material suitable for making peat fuel in bogs convenient to markets in the coal-less provinces of Ontario and Quebec. Much experimental work has been done on the development of commercial processes for the production of a satisfactory peat fuel. The annual output of peat fuel in the two provinces is small, amounting to 500 tons in 1938. There is also a small production of peat moss in all the provinces excepting the Maritimes.

### Phosphate

There are deposits of apatite in the Kingston-Ottawa area of Ontario extending into Quebec, and of low-grade sedimentary phosphate in southeastern British Columbia. Production has, however, been small, only 208 tons in 1938. The substantial Canadian requirements of phosphate rock and superphosphate for fertilizer use are imported, almost wholly from the United States, such imports aggregating 128,409 tons of the former and 114,357 tons of the latter in 1938.

### Pyrites

There was formerly a substantial production of pyrites in Canada from deposits in Quebec, Ontario, and British Columbia, but this ceased a number of years ago, due to loss of markets to elemental sulphur produced in the southern United States.

Pyrites deposits in northern Ontario and northern British Columbia are again under development. There is a recovery of pyrites concentrate from the treatment of the copper-pyrites ores produced by the Eustis and Aldermac mines in Quebec and the Britannia mine in British Columbia The sulphur content of such concentrate exported in 1938 amounted to 22,109 tons.

### Sodium Carbonate

There is a small intermittent production of natural soda ash—252 tons in 1938—in central British Columbia, the sources being lakes in which the sodium carbonate occurs as deposits of natron or as brines.

### Titanium

Deposits of ilmentite of considerable extent, with from 18 to 25 per cent titanium content, are situated in Charlevoix and Terrebonne Counties in Quebec. There are also numerous deposits of titaniferous magnetite, with 5 per cent or more of titanium, in Quebec and northern Ontario. The production, all from Quebec, is small and variable, amounting to only 207 tons of ore in 1938 as compared with 4,229 tons in 1937.

### Tungsten

Scheelite, and, more rarely, wolframite and tungstite have been found in Nova Scotia, New Brunswick, Manitoba, British Columbia, and Yukon Territory. There has been no production since 1918, although exploratory and development work have been carried on on some of the deposits. The total production up to that time amounted to a few hundred tons of concentrate from the Maritime Provinces, and a small quantity from Yukon Territory.

### Volcanic Dust

Small quantities have been produced intermittently from deposits near Swift Current, Saskatchewan, and near Williams Lake in British Columbia, the last recorded output being 31 tons in 1934 from Saskatchewan. There are other undeveloped deposits in these two provinces and in Alberta.

## THE DOMINION GOVERNMENT'S MINERAL EXHIBIT AT NEW YORK WORLD'S FAIR

The mineral exhibit installed in the Canadian Pavilion by the Department of Mines and Resources has been designed to utilize the limited space available to the best advantage in presenting a few of the high-lights of Canada's widely diversified mining industry. The exhibit relates only to those minerals, in the production of which Canada has already attained, or is rapidly attaining, a leading position among world producers, such minerals, including gold, nickel, copper, asbestos, lead, and zinc, the platinum metals, radium, and petroleum.

Occupying the lower foreground of the exhibit is a large map of the Dominion, showing the six major physiographic regions, the political divisions, the principal railway and aerial transportation routes, and the locations of the mines and areas from which these minerals are produced. Above and behind this map is a stage opening, behind which is a revolving stage in eight sectors, each presenting by a combination of models in the foreground and a pictorial background, a scene of outstanding interest in relation to the production of one of these minerals in Canada (lead and zinc being associated in one of the sectors).

The present rate of production is illustrated by the use of models; and other salient information is also presented. As each sector of the revolving stage in turn registers behind the stage opening, the producing areas on the map of the section of the mineral industry depicted are illuminated, and the operating mechanism halts for the time necessary to enable the spectator to obtain a general appreciation of Canada's position as a producer of that particular mineral.

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